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ABSTRACT

This student manual introducing the starting system is the first of three in an instructional package on the starting system in the Small Engine Repair Series for handicapped students. The stated purpose for the booklet is to help students learn things about the starting system, safety, and good habits. Informative material and diagrams are provided on the starting system, four types of small gas engine starters, parts of the rope rewind starter, safety rules, and good work habits. Review questions follow brief sections of information. Two rating scales and charts are included for evaluation of student progress. (YLB)

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STARTING SYSTEM

INTRODUCTION: THINGS FOR YOU TO KNOW

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SMALL ENGINE REPAIR SERIES

STUDENT MANUAL-INTRODUCTION

THINGS FOR YOU TO KNOW

**Prepared by
Pamela Hill**

**MATERIALS DEVELOPED AND DISTRIBUTED BY
OCCUPATIONAL CURRICULUM LABORATORY
EAST TEXAS STATE UNIVERSITY
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WHAT YOU WILL FIND IN THIS BOOKLET

The point of this booklet	Page 1
What you will have to know and do	Page 2
Purpose of the starting system	Page 3
The 4 types of small gas engine starters	Page 6
The parts of the rope rewind starter	Page 14
How the rope rewind starter starts the engine	Page 18
What do you know about the starting system?	Page 23
Safety to follow	Page 25
Good work habits to follow	Page 40
Can you follow safety and good work habits?	Page 46



"These students are all following safety rules."



THE POINT OF THIS BOOKLET

As a small engine mechanic, you may have to repair the starting system on small gas engines like the lawnmower. This booklet will help you learn:

- Things about the starting system
- Safety and good work habits to follow

As you learn about the starting system, you and your teacher can rate your progress on the charts on pages 23 and 46.

WHAT YOU WILL HAVE TO KNOW AND DO

Before you learn to do the repair jobs on the starting system, you will need to know and do some things. These are:

KNOW

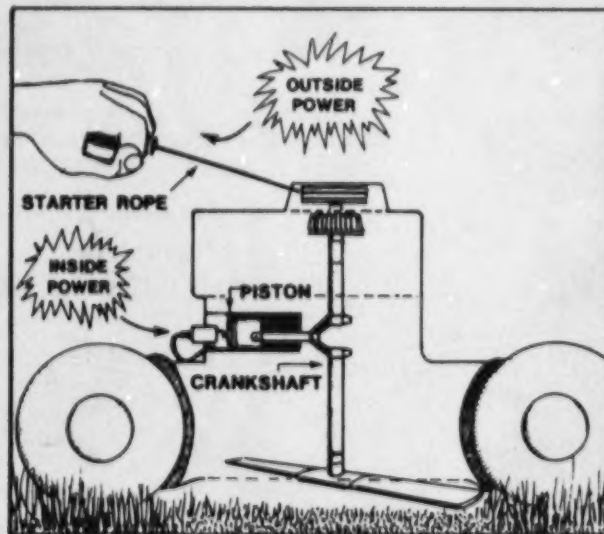
- The purpose of the starting system
- The 4 types of small gas engine starters
- The parts of the rope rewind starter
- How the rope rewind starter starts the engine

DO

- Follow safety rules
- Follow good work habits

PURPOSE OF THE STARTING SYSTEM

The starting system is a way to give the engine enough *outside* power to turn the crankshaft until the fuel mixture ignites and lets the *inside* power from the burning fuel start the engine.



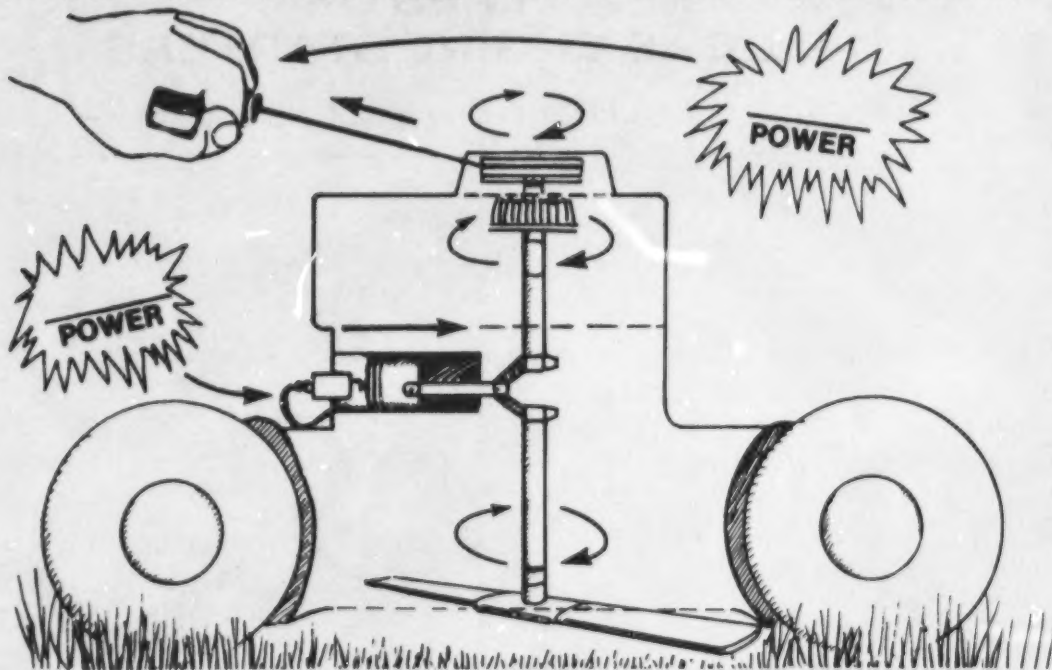
HOW MUCH DO YOU REMEMBER?

A. Circle the 2 correct answers.

The starting system is:

1. A way to put gasoline into the engine so that it will start.
2. A way to give the engine enough *outside* power to turn the crankshaft until the fuel mixture ignites.
3. A way to give the engine enough *outside* power to let the *inside* power from the burning fuel start the engine
4. A way to give the engine enough air to breathe

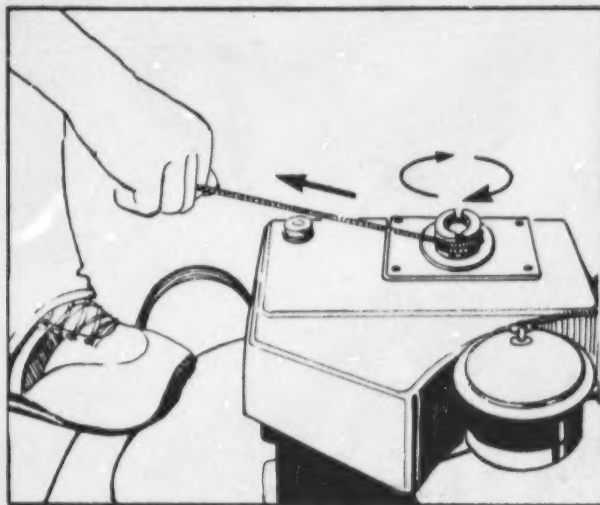
B. Write the word "OUTSIDE" or "INSIDE" In the correct blanks.



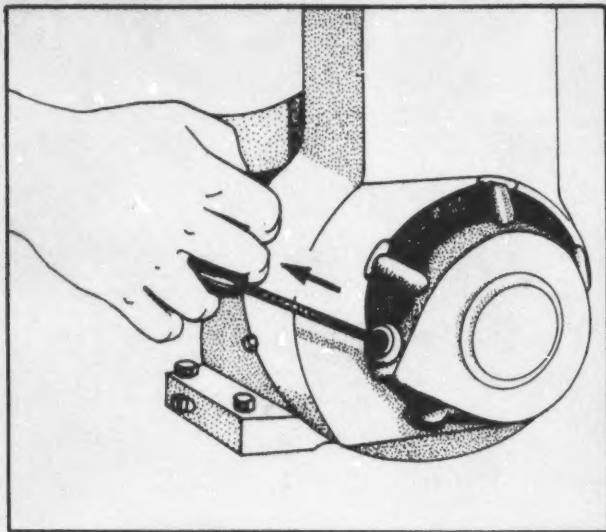
THE 4 TYPES OF SMALL GAS ENGINE STARTERS

There are 4 types of starters for small gas engines.

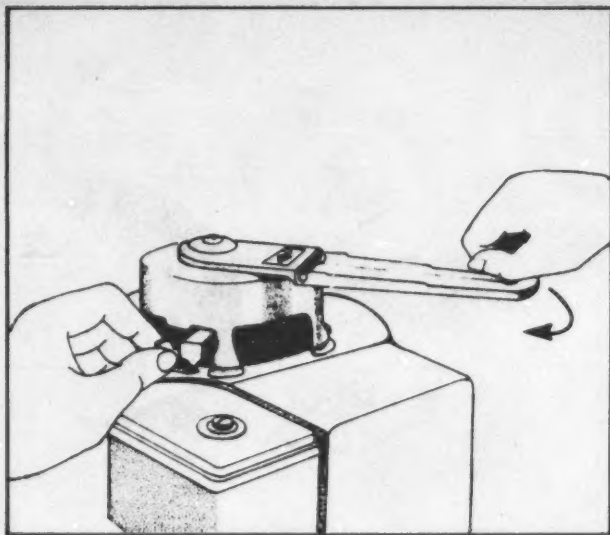
1. Rope wind starter—after each pull on the rope, the rope must be wound on the pulley by hand.



2. Rope rewind starter*—after each pull on the rope, a spring will rewind the rope on the pulley.

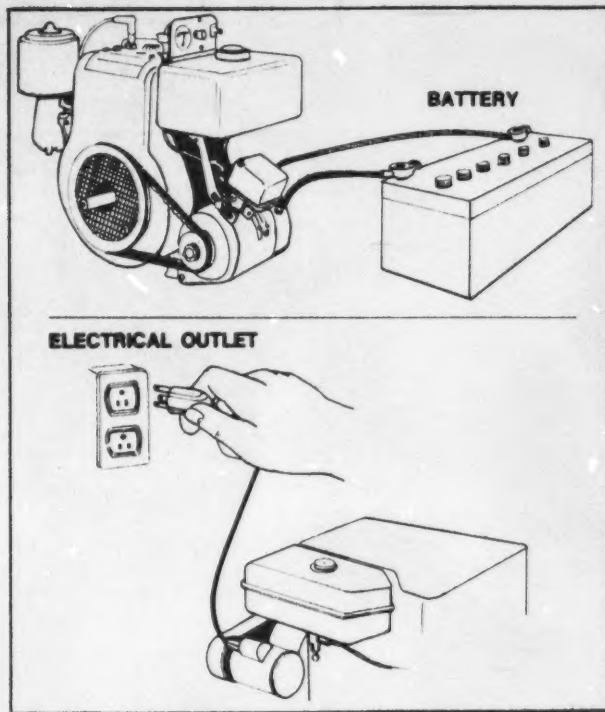


*In the other Student Manuals on STARTING SYSTEMS, you will learn to do repair jobs only on rope rewind starters.



3. Wind-up starter—does not have a rope. A crank and handle wind up a spring to start the engine.

4. Electric starter—starts the engine by plugging it into an electrical outlet and pushing a button or switching on a battery and generator.



HOW MUCH DO YOU REMEMBER?

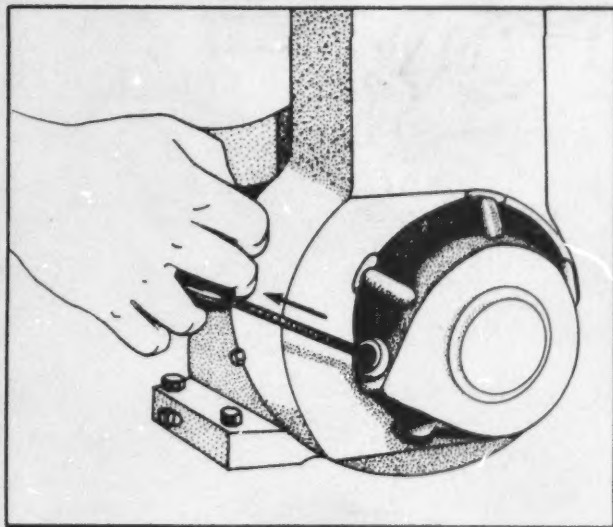
A. From the words below, write the name of each type of starter:

wind-up

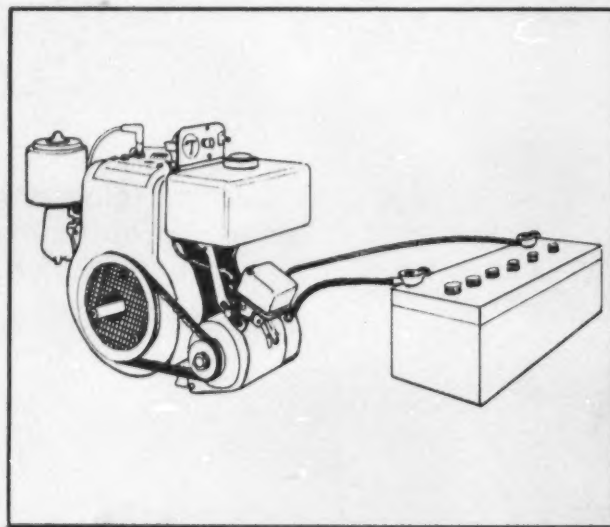
electric

rope wind

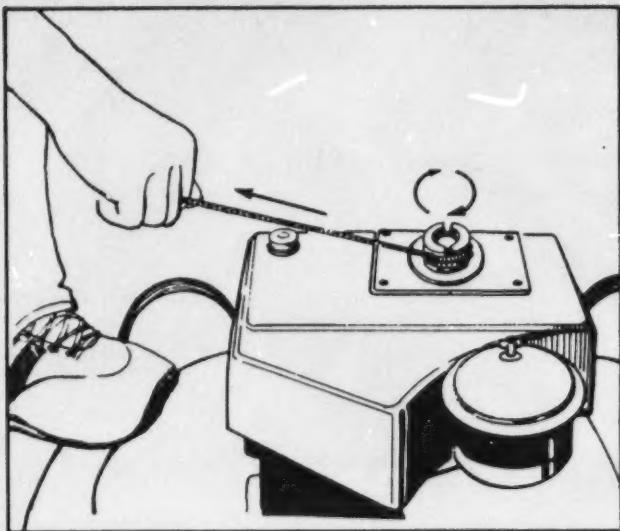
rope rewind



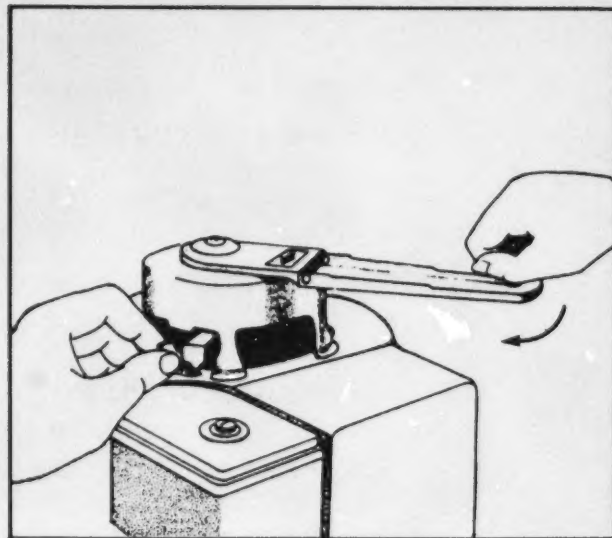
1. _____ STARTER



2. 16 _____ STARTER



3. _____ STARTER



4. _____ STARTER

B. Circle the correct answer.

1. Rope wind starter:

- a. After each pull on the rope, the rope must be wound on the pulley by hand.
- b. Has no rope.
- c. Is started by a battery and generator.

2. Rope rewind starter:

- a. The rope will come off the pulley.
- b. After each pull on the rope, a spring will rewind the rope on the pulley.
- c. A crank and handle starts the engine.

3. Wind-up starter:

- a. A crank and handle wind up a spring to start the engine.**
- b. Has a rope.**
- c. Is started by switching on a battery and generator.**

4. Electric starter:

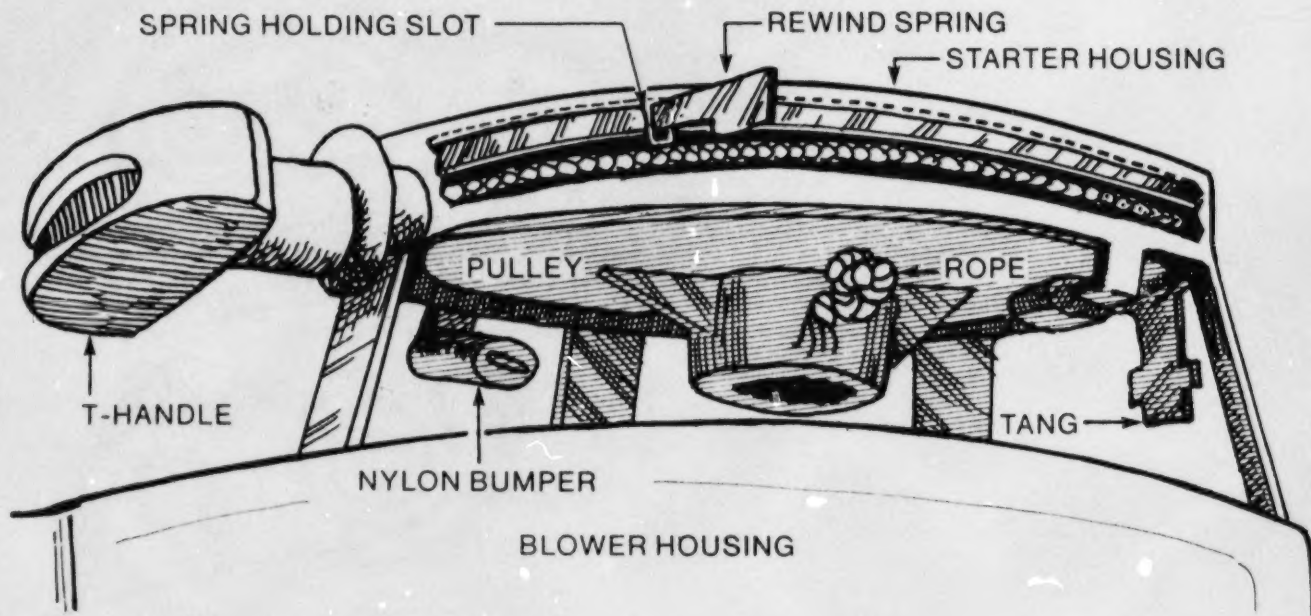
- a. A crank and handle start the engine.**
- b. Starts the engine by plugging it into an electrical outlet and pushing a button or switching on a battery and generator.**
- c. Has a rope that rewinds on a pulley.**

THE PARTS OF THE ROPE REWIND STARTER

Before you learn the repair jobs on the rope rewind starter, you will want to know the different parts and what they do.

1. Starter housing—cover for the starter parts.
2. Rewind spring—rewinds the rope after it has been pulled.
3. Spring holding slot—opening in starter housing that holds the spring in place.
4. Pulley—housing for the wound up spring and rope. The pulley also turns the crankshaft.
5. Rope—nylon rope that is about 4 to 5 feet long that is wound on the pulley.
6. T-handle—rubber handle on the end of the rope. To pull the rope, you hold onto the T-handle.
7. Nylon bumper—a piece of material that fits onto the tang. It keeps the metal tang from wearing into the pulley.
8. Blower housing—cover for the flywheel
9. Tang—a piece of metal from the starter housing that holds the pulley in place.

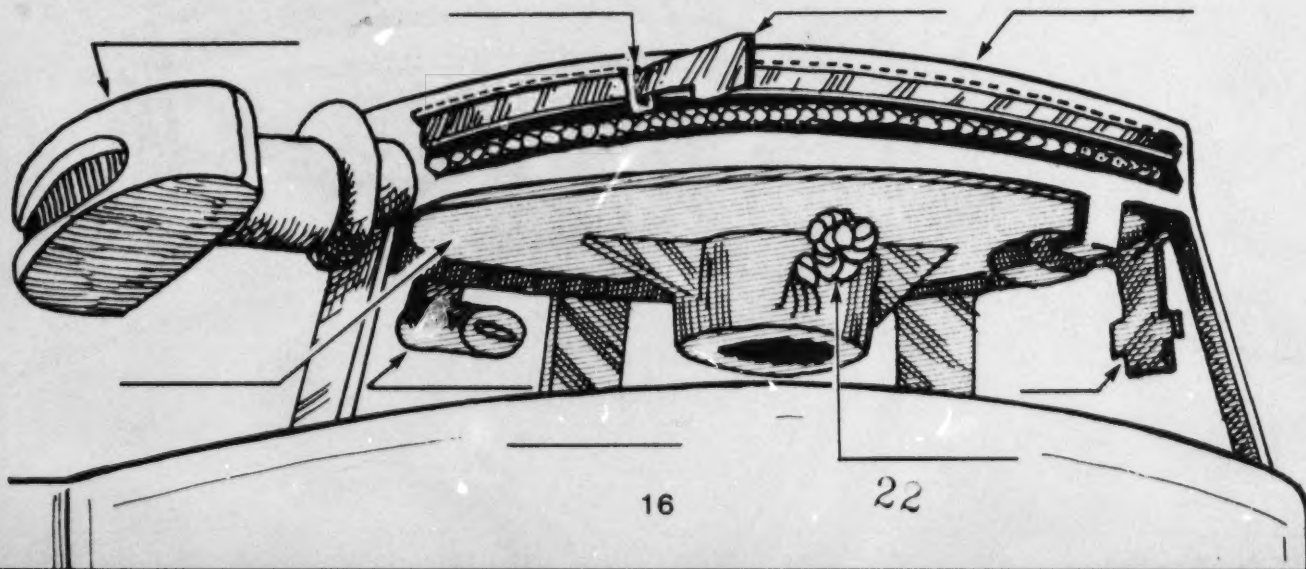
PARTS OF A ROPE REWIND STARTER



HOW MUCH DO YOU REMEMBER?

A. From the words below, write in the blanks the correct number that identifies each part of the rope rewind starter.

- | | | | |
|-----------|--------------------|-------------|------------------------|
| 1. Pulley | 3. Starter housing | 5. Tang | 7. Blower housing |
| 2. Rope | 4. Rewind spring | 6. T-handle | 8. Nylon bumper |
| | | | 9. Spring holding slot |



B.

Fill in the blanks in the sentences, using the words listed below. Then fill in the crossword puzzle.

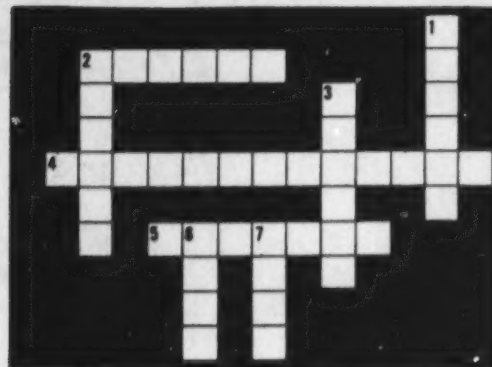
T-handle	starter
blower	spring holding
bumper	tang
rewind	rope
pulley	

ACROSS

2. The _____ housing is a cover for the flywheel.
4. The _____ slot holds the spring in place.
5. The _____ housing is the cover for the starter parts.

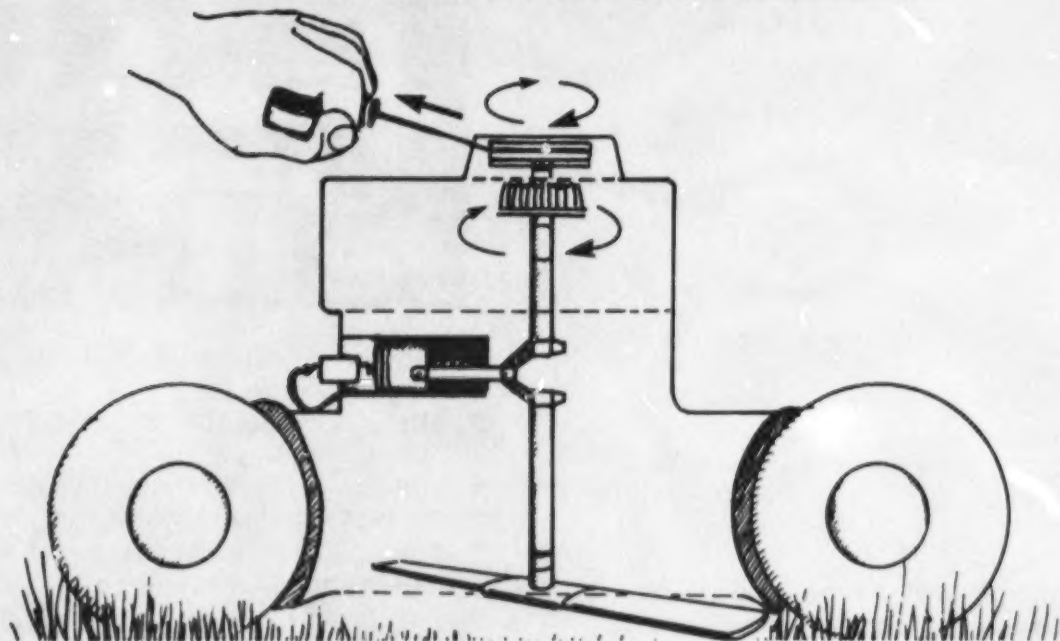
DOWN

1. A spring that rewinds the rope after it has been pulled is called a _____ spring.

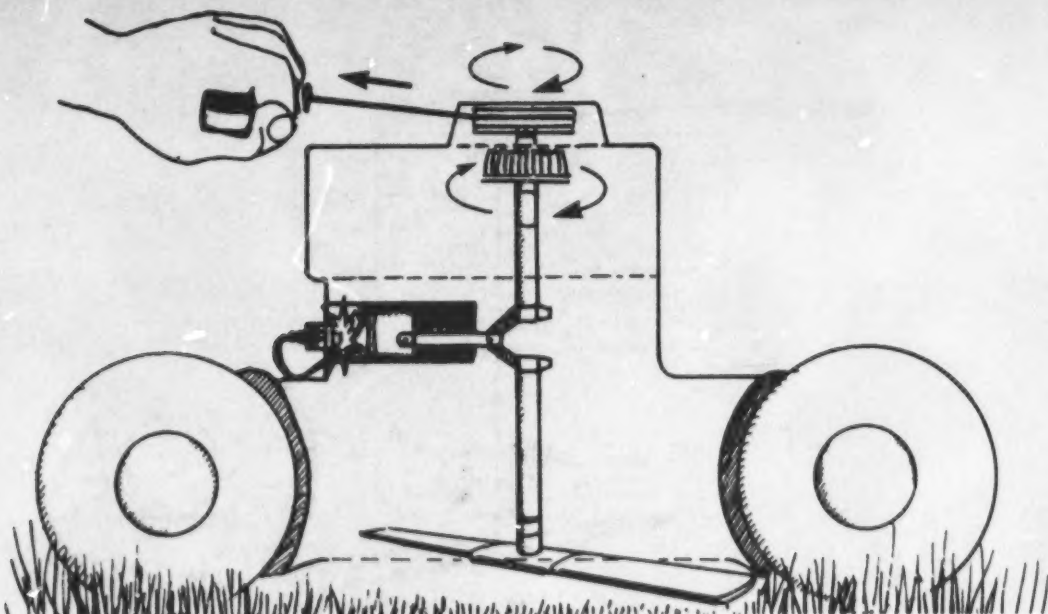


2. A piece of rubber that fits onto the tang is called a _____.
3. The _____ is the housing for the spring and rope.
6. The _____ is a piece of metal that holds the pulley in place.
7. The _____ is a cord made of nylon, and is about 4-5 feet long.
8. The rubber handle on the end of a rope is called a _____-_____.

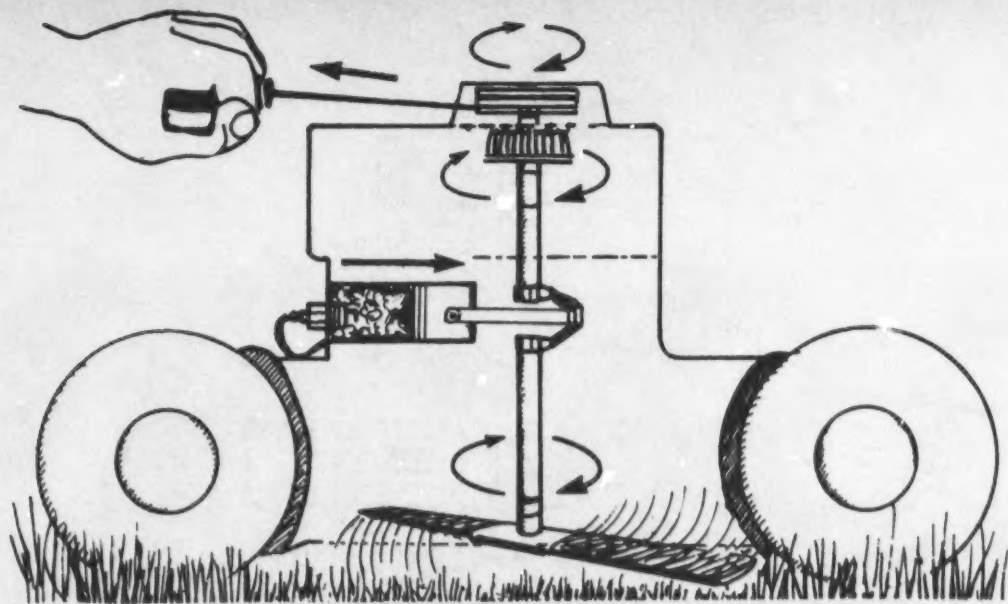
HOW THE ROPE REWIND STARTER STARTS THE ENGINE



1. When the rope is quickly pulled, the pulley turns the crankshaft and flywheel.

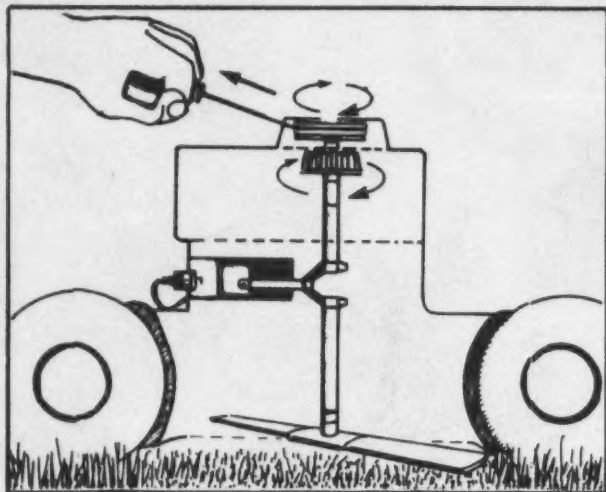


2. As the crankshaft and flywheel turn, the piston in the cylinder pushes the fuel mixture into the combustion chamber and the fuel mixture ignites. When the fuel mixture ignites, the starter stops turning.



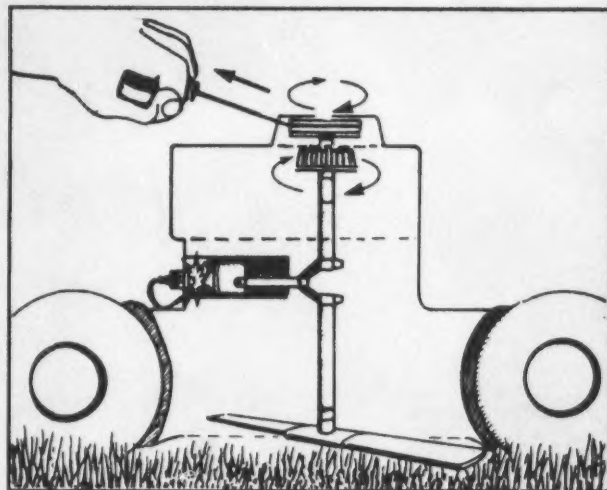
3. Power from the burning fuel mixture pushes the piston down and then turns the crankshaft. The crankshaft then turns the lawnmower blades. The engine has now started and will run on its own power.

HOW MUCH DO YOU REMEMBER?

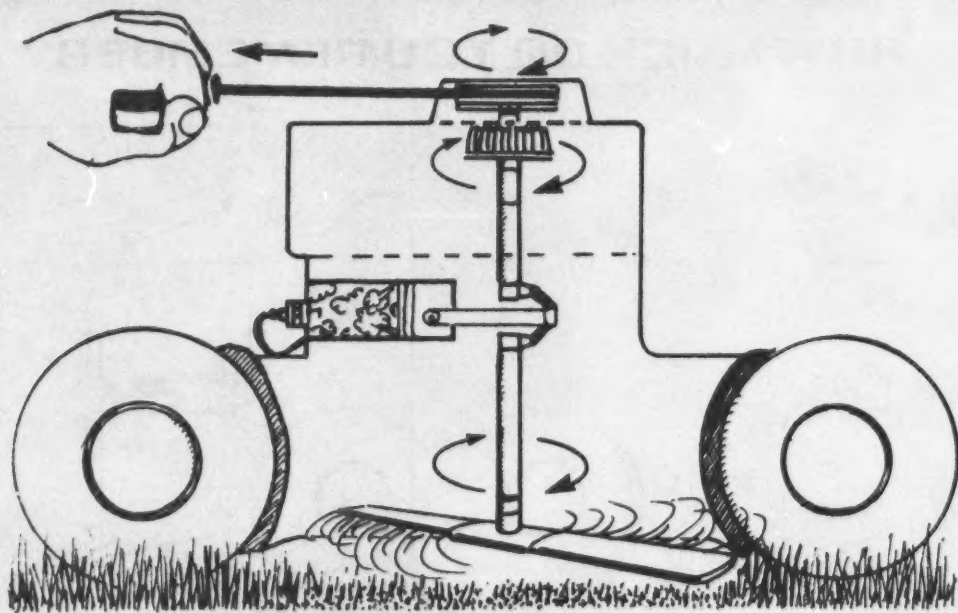


Tell how the rope rewind starter works by completing the sentences under each picture.

1. When the rope is pulled, the pulley turns the _____ and _____.



2. The _____ pushes the _____ mixture into the combustion chamber and the fuel mixture _____.



3. _____ from the burning fuel mixture pushes the piston _____ and then turns the crankshaft. The crankshaft then turns the lawnmower blades. The engine has now _____ and will run on its _____ power.

WHAT DO YOU KNOW ABOUT THE STARTING SYSTEM?

Have your teacher help you rate what you have learned about the starting system. Use this rating scale and chart for 2 weeks and watch your progress.

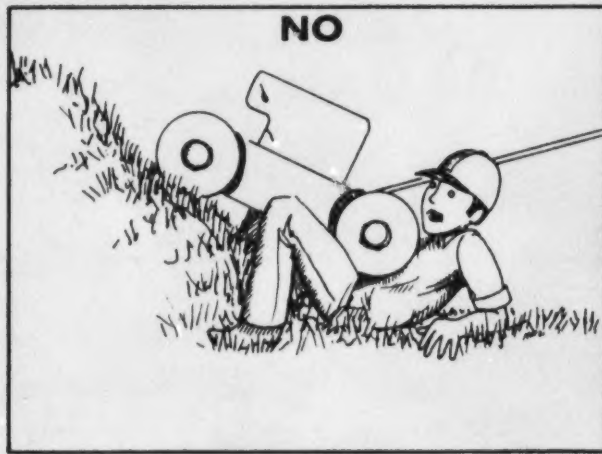
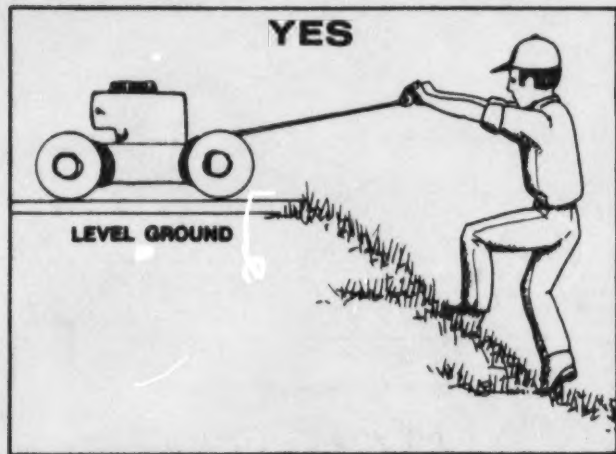
RATING MEANING

- 1** = Cannot identify the fact, part, or step
- 2** = Remembers most of the facts, parts, or steps
- 3** = Understands and explains the facts, parts, or steps

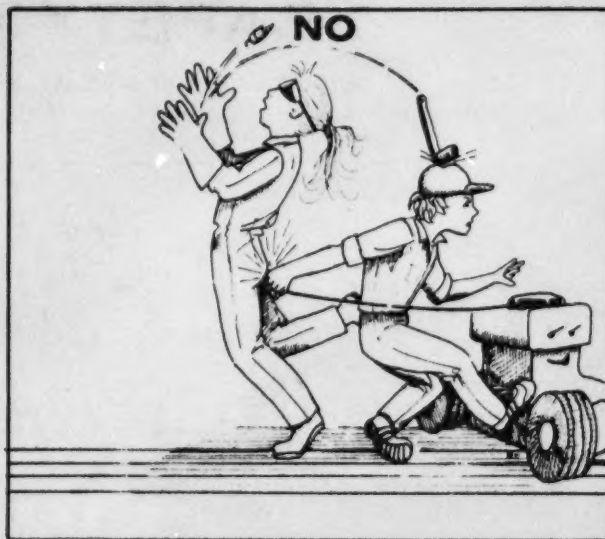
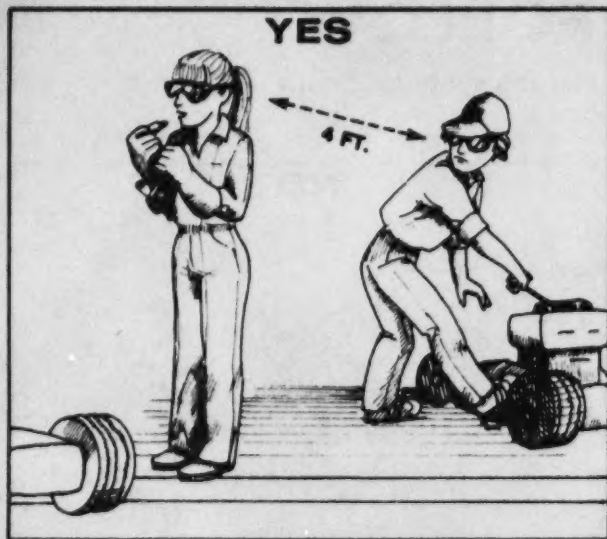
THINGS TO KNOW ABOUT THE STARTING SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
1. Tell the purpose of the starting system										
2. Identify the 4 types of small gas engine starters and tell how they are different from each other										
3. Name and find the parts on the rope rewind starter										
4. Tell what the parts on the rope rewind starter do										
5. Tell how the rope rewind starter starts the engine										

SAFETY TO FOLLOW

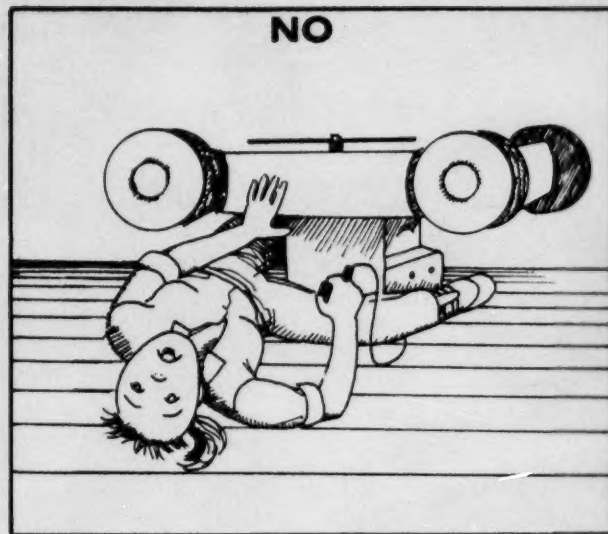
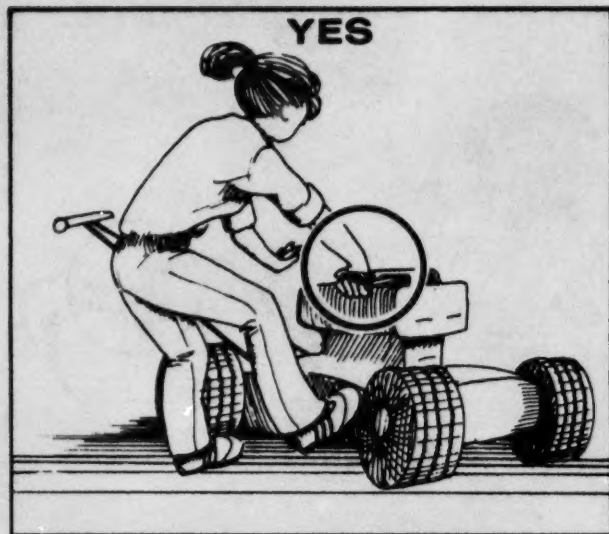
Here are some safety rules for working on starting systems. Learn these and follow them when you work on small gas engines.



1. Before starting the engine, see that it is on level ground. The engine could easily tip over when the rope is pulled if the engine is not balanced.

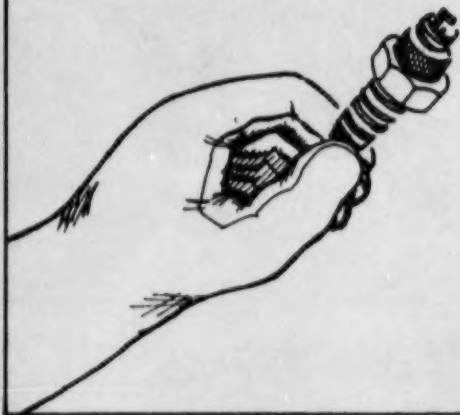


2. Before pulling the starter rope, look behind you to see that nothing is in the way and there is plenty of room to pull the rope out all the way.

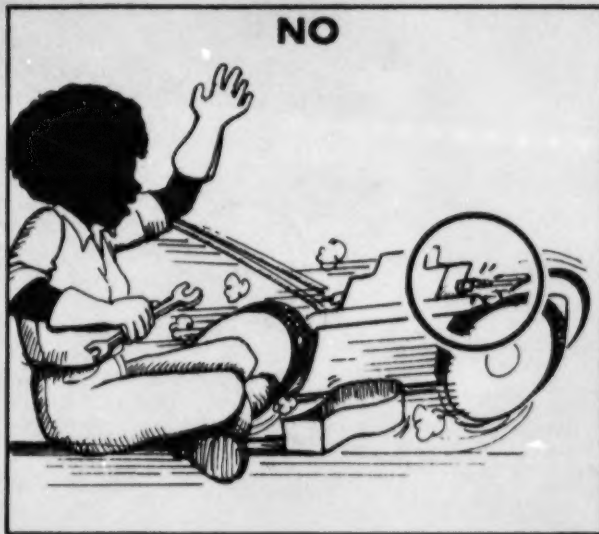


3. When cranking the engine, put one foot on the lawnmower or brace one hand against the shroud to keep from pulling the engine onto you.

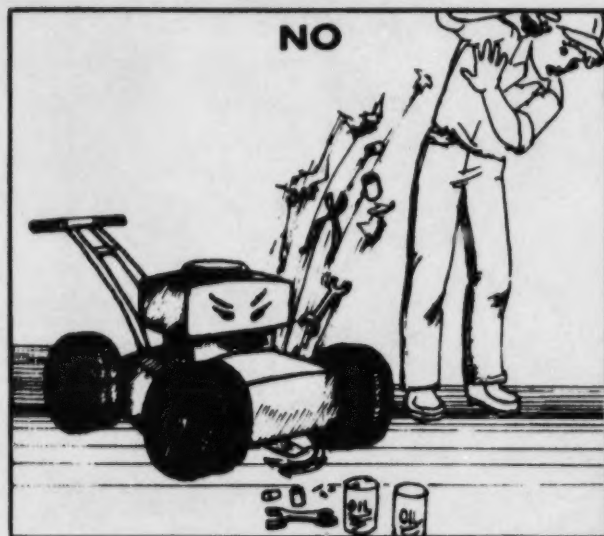
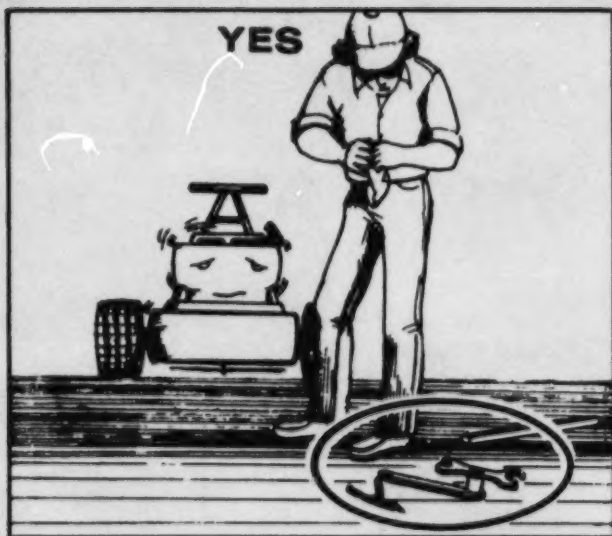
YES



NO



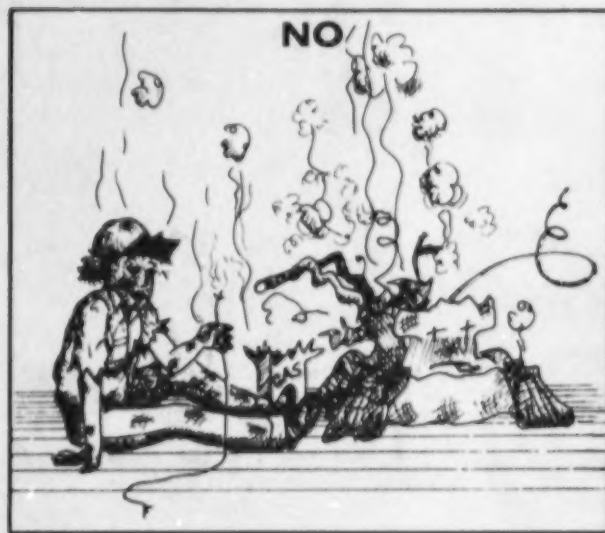
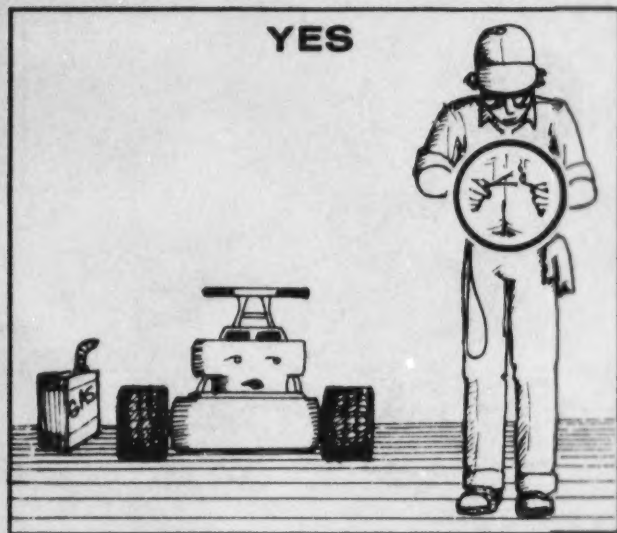
4. Always remove the spark plug before working on the engine so that it does not accidentally start.



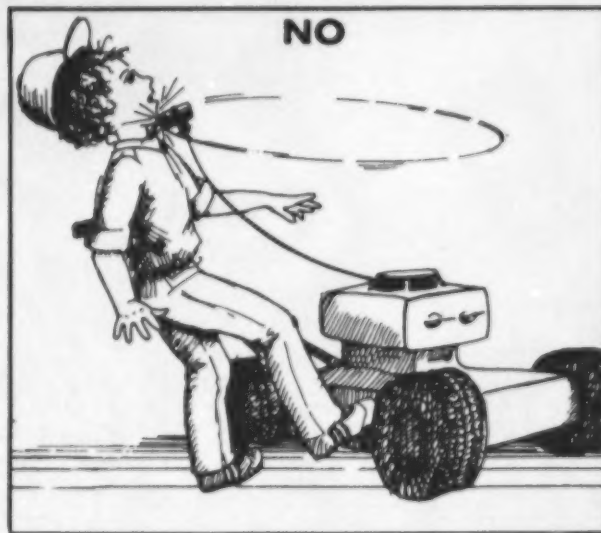
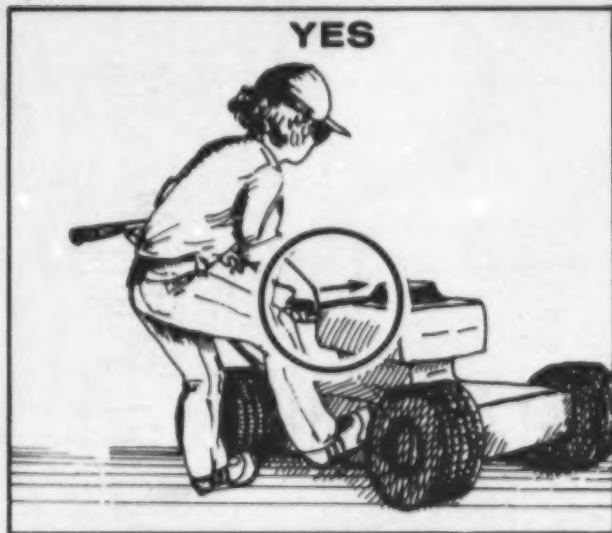
5. When an engine is running, keep tools and feet away from the lawnmower blades and other moving parts.



6. When placing the shroud in a vise, be careful not to overtighten the vise or the shroud will bend cut of shape and then not fit on the engine.



7. Light matches away from gasoline and engines so that a fire is not started.



8. When letting the rope rewind onto the pulley, hold onto the rope so that it doesn't accidentally fly up and hit you.

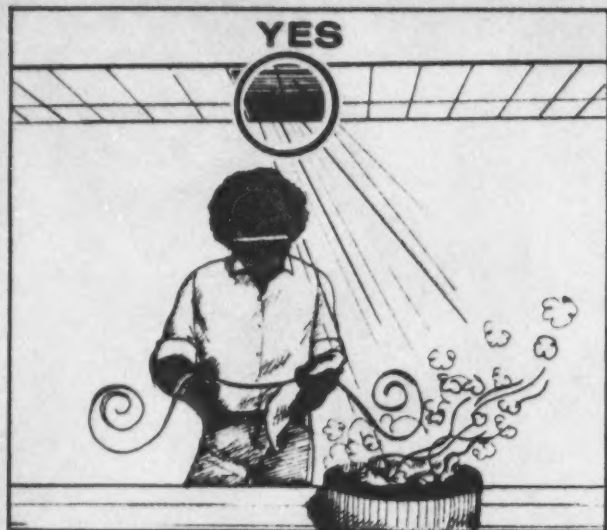
YES



NO



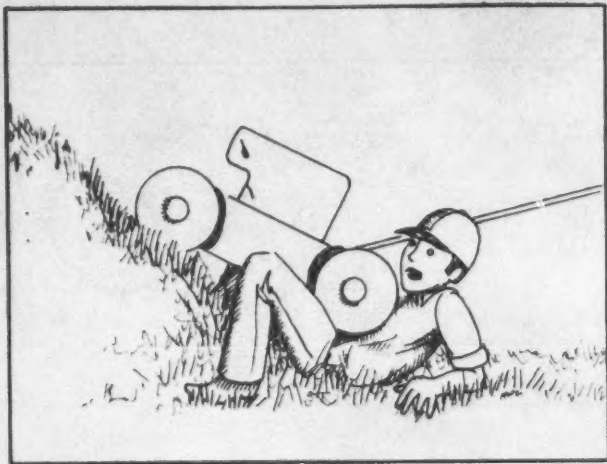
9. When repairing and cleaning the rewind spring, wear safety glasses and hold tightly onto the spring so that it doesn't wind up and hit you.



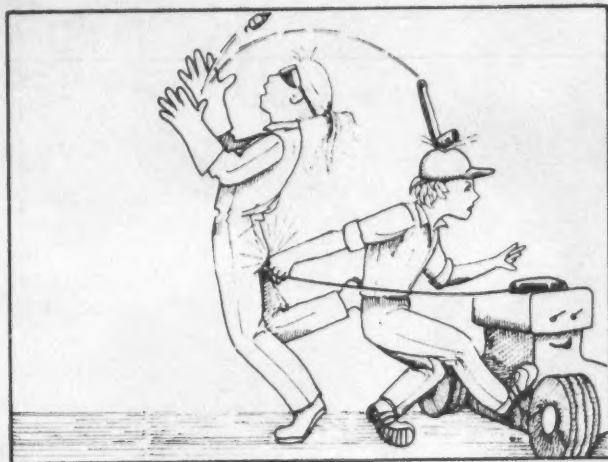
10. When using cleaning fluid, open a window or turn on the air in the shop so that the fumes from the cleaning fluid will not hurt you.

HOW MUCH DO YOU REMEMBER?

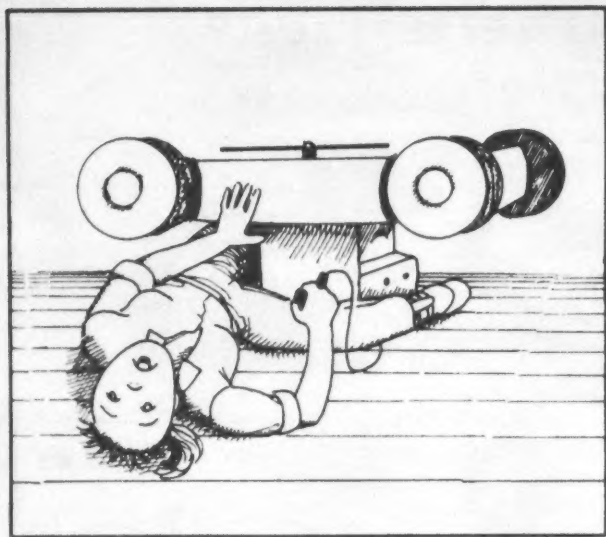
In each of the pictures below, tell what safety rule should be followed.



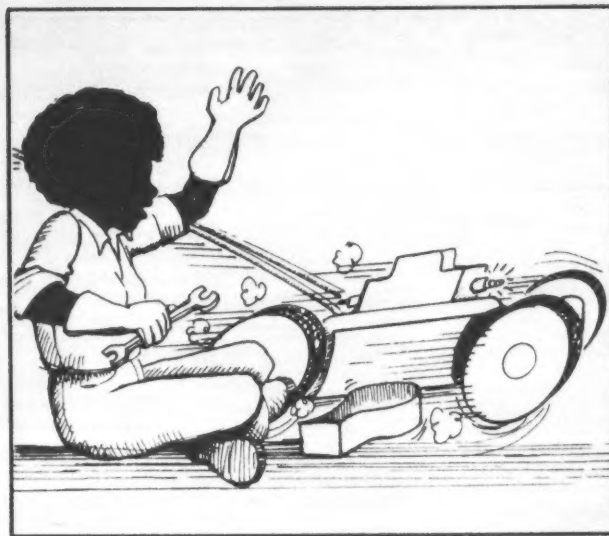
1. _____



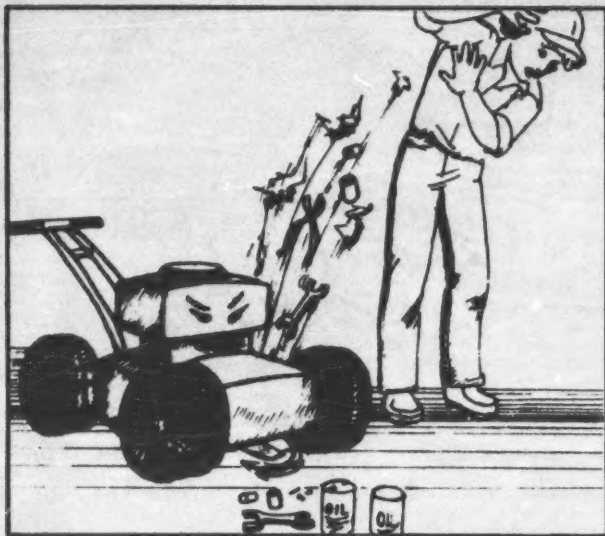
2. _____



3. _____



4. _____



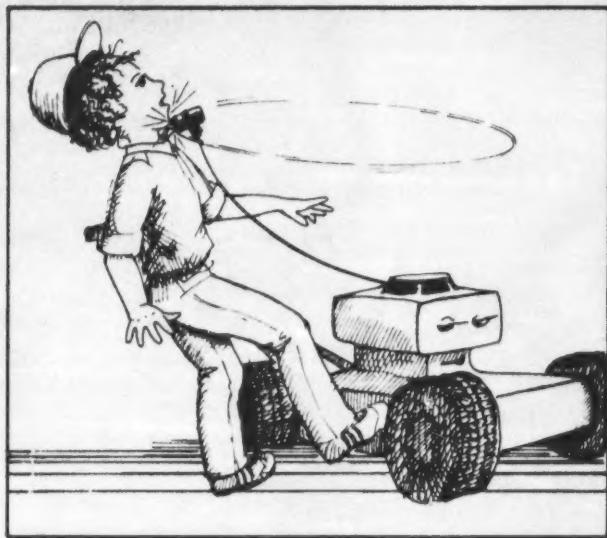
5. _____



6. _____



7. _____



8. _____



9. _____

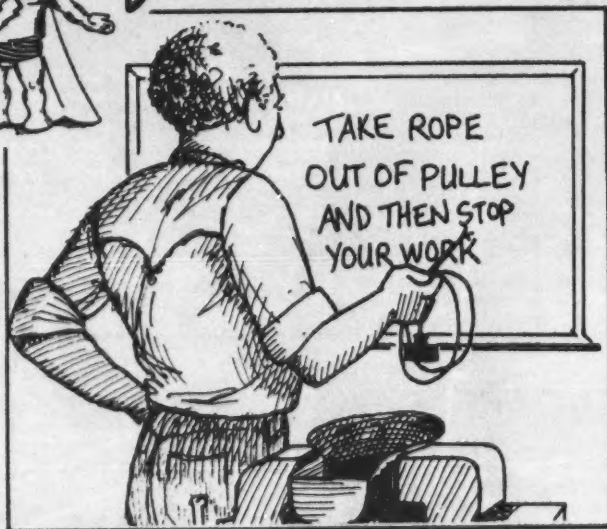


10. _____

GOOD WORK HABITS TO FOLLOW



"This student is following the teacher's instructions."



1. Follow your teacher's instructions.
2. Wear well-fitting clothes that are not loose and baggy. Do not wear jewelry. These may catch in moving parts of the engine.
3. Do what you say you will do. In other words, be reliable.
4. Use tools correctly and safely.
5. Discuss any problems that you have instead of arguing or fighting.

6. Stay on your job instead of horse playing in the shop.
7. Check your work for errors and try to correct them.
8. When you finish a job, clean the tools and work area, and return tools to the tool room.
9. Walk instead of run in the shop.
10. Be friendly, helpful, and honest.



**"This student is checking
her work for errors."**

HOW MUCH DO YOU REMEMBER?

A. Circle the correct answer.

1. Following your teacher's instructions is when you:
 - a. do what your teacher tells you to do and then try to finish the job without knowing how to do it.
 - b. try to take short cuts and get the job done quicker.
 - c. do exactly what your teacher tells you to do and no more.
2. When working on an engine, you should not wear jewelry or baggy clothes because:
 - a. they are uncomfortable.
 - b. they might get caught in moving parts of the engine.
 - c. they don't look good.

3. Being reliable means:

- a. doing what you say you will do.
- b. being smart.
- c. being rough and tough.

4. Using a tool incorrectly and unsafely could:

- a. help you finish a job more quickly.
- b. not hurt the engine, tool, or mechanic.
- c. break the engine or tool or hurt the mechanic.

5. When another student is using a tool that you need and the student does not want to lend it to you, you should:

- a. hit the student in the nose.
- b. quietly discuss with the student that you only need the tool for a few minutes and that you will give it back.
- c. argue and accuse the student of being selfish.

6. Horseplaying in the shop is when you:
- a. leave your job and go have fun with the other students.
 - b. stay on your job and ignore the other students who are laughing and running around.
 - c. clean up your work area and put tools back in the tool room.
7. If you check your work for errors and try to correct them, then you are:
- a. wasting time.
 - b. being sloppy and not paying attention to your work.
 - c. trying to do a good job by looking for mistakes and then doing the job right.
8. When you finish a job, you should:
- a. go horseplay.
 - b. clean the tools and work area, and return tools to the tool room.
 - c. clean your work area, but leave the tools out for someone else.

9. While in the shop, you should walk instead of run because:
- a. it makes your teacher nervous when you run.
 - b. you could hurt yourself or someone else or break something.
 - c. You should always hurry so it's okay to run in the shop.
10. A small engine mechanic should try to:
- a. be friendly, helpful, and honest.
 - b. tell a lot of jokes.
 - c. put a wrench in their pocket and then forget to return it to the tool room.
- B. In your class, read each of the 10 good work habits. Tell what might happen if these work habits are not followed. Think of other good work habits that you and your class would like to follow.

CAN YOU FOLLOW SAFETY AND GOOD WORK HABITS?

As you learn the jobs on the starting system, have your teacher help you rate how well you follow safety and good work habits. Use this rating scale and chart for 2 weeks and watch your progress.

RATING

MEANING

- 1** = Does not do the safety or work habit
- 2** = Sometimes does the safety or work habit,
but needs to be reminded
- 3** = Does the safety or work habit most of the time

SAFETY AND GOOD WORK HABITS	DAYS									
	1	2	3	4	5	6	7	8	9	10
1. Before starting the engine, sees that it is on level ground										
2. Before pulling the starter rope, looks behind to see that nothing is in the way										
3. When cranking the engine, braces self on engine										
4. Removes spark plug before working on the engine										
5. Keeps tools and feet away from running engine										
6. Does not overtighten vise on shroud										
7. Lights matches away from gasoline and engines										

THINGS TO KNOW ABOUT THE STARTING SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
8. Holds onto rope when it is rewinding onto pulley										
9. Wears safety glasses and holds tightly onto rewind spring when servicing it										
10. Uses cleaning fluid in well-ventilated area										
11. Follows the teacher's instructions										
12. Wears well-fitting clothes										
13. Is reliable										
14. Uses tools correctly and safely										

THINGS TO KNOW ABOUT THE STARTING SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
15. Discusses problems instead of arguing or fighting										
16. Stays on job										
17. Checks work for errors and corrects them										
18. Cleans tools and work area and returns tools to tool room										
19. Walks instead of runs										
20. Is friendly, helpful, and honest										